CATACLYSMIC VARIABLES AND RELATED PHYSICS

2nd Technion Haifa Conference, Eilat, Israel, January 1993

Edited by: Oded Regev and Giora Shaviv

FINAL TECHNICAL REPORT

PRINCIPAL INVESTIGATOR: Dr. Michael Shara

INSTITUTION: NASA-Goddard

GRANT NUMBER: NAG5-2056

PROJECT PERIOD: April 1, 1990 - March 31, 1991

PROJECT TITLE: *Critical Tests of the Hibernation Scenario and the LT Evolution*

This project was a survey of a two square degree field in the Southern Milky Way for faint cataclysmic variables. The goal of the project was to determine the space density of faint CVs.

Almost two million stars were catalogued and examined for color. The very bluest 50 objects were followed up spectrographically, and 13 were found to be probable cataclysmic. This represents a surface density 1,000 times higher than that in all previous surveys for faint, blue objects. It supports the hibernation scenario of cataclysmic evolution, which posits that most novae spend most of their time in a very low mass transfer state.

The results were published in *Cataclysmic Variables and Related Physics*, 2nd Technion Haifa Conference, Eilat, Israel 1993.

This grant did not yield any patents or inventions.

Hunting for Faint (Hibernating?) Cataclysmics

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[4]Lancashire Polytechnic
[5]Durham University

ABSTRACT

Our ongoing U-B survey in the field of the nova of 1437 A.D. has yielded 13 spectrographically confirmed, very faint cataclysmic binaries. The objects' blue colors and low Galactic latitudes imply that they must be closer than about 1 kpc. Their space density is then much higher than that commonly quoted for CVs.

1. MOTIVATION and OBSERVATIONS

In an earlier note Shara et al (1990) reported preliminary results in the search for the remnant of the nova of 1437 A.D. Seven faint, UV-bright stars were found (in one square degree) to have Balmer emission spectra, strongly suggesting that they are CVs. Spectroscopy of all 53 UV-bright objects in two square degrees has now been completed. The number of spectrographically confirmed, Balmer emission line objects is now 13.

A control field a few degrees away has been partially analyzed. Three cataclysmics in 0.5 square degrees have been found to date. This demonstrates that the field of Nova Sco 1437 A.D. is not somehow pathologically rich in cataclysmics.

Four of the 13 CV candidates have been monitored photometrically for 6 hours or longer. The brightest object shows a clearly sinusoidal light curve indicative of a 3.6 hour period. The other three all flicker, with amplitudes of a few tenths of a magnitude, on timescales of an hour or longer.

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REFERENCES

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2. ANALYSIS AND CONCLUSIONS

On the basis of their photometric variability, Balmer emission line spectra, very blue colors and faintness (B=19.2 is the mean) we conclude that these objects must be rather closeby, intrinsically faint cataclysmic binaries. At distances of 1 kpc. or less (to explain their very blue colors) these objects must have a space density approaching 1 per 10,000 pc**3, supportive of the prediction of the hibernation scenario of cataclysmic evolution.

The distances of these thirteen objects must be determined with greater accuracy to prove their high space density. Photometric or spectroscopic detections of the red dwarfs in these systems would therefore be invaluable.

REFERENCES

Shara,M.M., Potter,P., Moffat,A.F.J., Bode,M., and Stephenson,F.R., in " Physics of Classical Novae " eds. A. Cassatella and R. Viotti (Berlin : Springer-Verlag)

FEDERAL CASH TRANSACTION REPORT

(See instructions on the back. If report is for more than one grant or assistance agreement, attach completed Standard Form 272-A.

Approved by Office of Management and Budget, No. 80-R0182

1. Federal sponsoring agency and organizational element of which this report is submitted.
NASA - HEADQUARTERS
ACCOUNTING DEPT 13H
WASHINGTON, DC 20546

2. RECIPIENT ORGANIZATION
Name
SPACE TELESCOPE SCIENCE INSTITUTE
Number and Street
3700 SAN MARTIN DRIVE
City, State & Zip Code:
BALTIMORE, MD 21218

3. FEDERAL EMPLOYER IDENTIFICATION NO. 86-0138043

4. Federal grant or other identification number. NAGW-2056

5. Recipient's account number identification number G002.64500

6. Letter of credit number 100040

7. Last payment voucher number N/A
Give total number for this period

8. Payment Vouchers credited to your Account $92,797.18

9. Treasury checks received $0.00

10. PERIOD COVERED BY THIS REPORT
FROM: 04/01/90 TO: 03/31/92

11. STATUS OF FEDERAL CASH (See specific instructions on the back)		
	a. Cash on hand beginning of reporting period.	0.00
	b. Letter of credit withdrawals - wire transfer	92,797.18
	c. Treasury check payments	0.00
	d. Total receipts (sum of lines b and c)	92,797.18
	e. Total cash available (Sum of lines a and d)	92,797.18
	f. Gross disbursements	92,797.18
	g. Federal share of program income	0.00
	h. Net disbursements (Line f minus line g)	92,797.18
	i. Adjustments of prior periods	0.00
	j. Cash on hand end of period	0.00

12. THE AMOUNT SHOWN ON LINE 11J, ABOVE, REPRESENTS CASH REQUIREMENTS FOR THE ENSUING Days	13. OTHER INFORMATION	
	a. Interest income	0.00
	b. Advances to subgrantees or subcontractors	0.00

14. REMARKS (Attach additional sheets of plain paper, if more space is required)

FINAL 272 REPORT - NAGW-2056

15. Certification

I certify to the best of my knowledge and belief that this report is true in all respects and that all disbursements have been made for the purpose and conditions of the grant or agreement.

AUTHORIZED CERTIFYING OFFICIAL

SIGNATURE Susan K Philbin

DATE REPORT SUBMITTED 8/29/94

TYPED OR PRINTED NAME AND TITLE
SUSAN K. PHILBIN ACCOUNTANT

TELEPHONE (410) 338-4407

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272-101

STANDARD FORM 272 (7-76)
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FEDERAL CASH TRANSACTION REPORT
CONTINUATION

(This form is completed and attached to Standard Form 272 only when reporting more than one grant or assistance agreement.)

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1. Federal sponsoring agency and organizational element of which this report is submitted.
NASA - HEADQUARTERS
ACCOUNTING DEPT 13H
WASHINGTON, DC 20546

2. RECIPIENT ORGANIZATION (Give name only as shown in item 2, SF 272)
SPACE TELESCOPE SCIENCE INSTITUTE

3. PERIOD COVERED BY THIS REPORT (As shown on SF 272)
FROM (month, day, year) 04/01/90
TO (month, day, year) 03/31/92

4. List information below for each grant or other agreement covered by this report. Use additional forms if more space is required.

FEDERAL GRANT OR OTHER IDENTIFICATION NUMBER *(Show a subdivision by other identifying numbers if required by the Federal Sponsoring Agency)* (a)	RECIPIENT ACCOUNT NUMBER OR OTHER IDENTIFYING NUMBER (b)	FEDERAL SHARE OF NET DISBURSEMENTS	
		NET DISBURSEMENTS (Gross disbursements less program income received) FOR REPORTING PERIOD (c)	CUMULATIVE NET DISBURSEMENTS (d)
NAGW-2056	G002.64500	0.00	92,797.18
5. TOTALS (Should correspond with amounts shown on SF 272 as follows: column (c) the same as line 11h; column (d) the sum of lines 11h and 11i of this SF 272 and cumulative disbursements shown on last report. Attach explanation of any differences.)		$0.00	$92,797.18

272-201

STANDARD FORM 272 (7-76)
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EQUIPMENT AND PROPERTY INVENTORY REPORT

Principal Investigator: Dr. Michael Shara

Grant : NAGW-2056

Equipment/Property Purchased:

Description	Model Number	Unit Cost
ICS/MC7 1.2 GB 5 1/2" Micropolis Disk Drive	N/A	$ 2,710.00
EDT8-LVL I Text Editor	N/A	$ 1,659.00
CDC WREN 7 1035 MB Sync Scsi Disk	N/A	$ 4,272.00
Video Digitizer	N/A	$ 288.20
EDT8 - Level 2 Text Editor	N/A	$ 2,494.50
Nicropolis 1.2 GB	N/A	$ 2,502.00
MACBRAV01 Modeler Package	N/A	$ 319.50
Multiport Repeater	MR9000C	$ 1,500.00
	Total	$ 15,745.20

PATENT/INVENTION REPORT

Principal Investigator: Dr. Michael Shara

Grant : NAGW-2056

Patents/Inventions Developed: NONE